FLIGHT DICTATES TRAINING

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(Your Health)

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Facilities and methods of conducting classes in special physical training for increasing the psychological resistance to various flight factors play an important role in maintaining the combat readiness of the pilot in stress situations. However, these facilities are still loosely tied into a single system. Scattered types of physical training directed toward the formation of psychophysiological qualities must be combined with other facilities, taking into account the specifics of flight activity. /44*

Special physical training should be set up based on general physical training in accordance with the missions carried out by any particular branch of aviation. At each stage of professional improvement and conditioning for resistance to unfavorable factors of flight, as well as during mastery of flights with combat applications and maximum use of the tactical-technical capacities of the aircraft, physical conditioning of the organism can become an important condition for accomplishing the mission, particularly during exposure to different extremal factors. Every pilot must remember that resistance of the organism to g-forces improves in the process of exercises on special equipment (swing-bar, swing board, etc.), as well as light athletics and gymnastics.

*Numbers in the margin indicate pagination of original foreign text.

By the aid of physical training facilities, one can increase resistance to g-forces by 30 — 40%. As investigations have now shown, the conditioning effect of physical training appears after 20 — 30 hours of exercises. Therefore, one-hour special exercises should be conducted three times a week. In the preparatory part, it is desirable to include walking, running, and general developmental exercises, as well as special exercises to strengthen the abdominal muscles and the muscles of the trunk (all possible bending maneuvers and turns of the trunk, using gymnastic benches, the parallel bars and other gear for this purposes). In the basic part, one can include the 400 meter run in one exercise period and special and gynmastic gear workouts in another. The final part of the exercises is conducted according to generally used plans.

An active and cognizant attitude of the pilot toward special physical exercise is a very important condition. If the pilot knows the psychophysiological fundamentals of unfavorable flight factors and the possibilities of increasing the resistance of the organism to these factors, he forms a certain psychological attitude with respect to the exercise period.

Today, means and methods have been developed for increasing the organism's resistance to roll, hypoxia, and breathing under excess pressure. Resistance to roll can be increased by training on the quad-bar and on ordinary swings and Barany chairs. With a gradual increase in the time of exposure to angular accelerations, one can succeed in significantly increasing the adaptation of the organism to this factor.

During active conditioning, physical exercises are employed which produce different accelerations which affect the vestibular analysor. These are acrobatic exercises, exercises on the swing board, gymnastic rings, and other special equipment, as well as

swimming using the "crawl" stroke, sports, and certain other types of physical training. A large place in the organization of such training is given overall strengthening of the organism and the nervous system. The strong muscles of the trunk, particularly those of the abdomen, prevent the displacement of internal organs under exposure to accelerations and withstand roll.

The advantage of active training over passive training consists in that in training the organism we strengthen the health and form a number of other qualities necessary for flight personnel. Physical training to increase psychophysiological resistance to roll is easily combined with conditioning resistance to g-forces. The plan and means of exercising remain the same, except acrobatic exercises are used in the preparatory part, with turns and somersaults, while in the basic part more exercises on the swing bar and other special gear are included. If possible, it is desirable to conclude the basic part with swimming using the "crawl" stroke and acrobatic exercises in the water.

For increasing resistance to hypoxia, physical exercises involving constant adaptation of the psychophysiological functions of the organism to oxygen deficiency are useful — for example, running medium and long distances, walking on skis and swimming.

High altitude resistance developed in the course of physical training has a number of advantages over that received in the pressure chamber (passive). In the first case, the organism adapts to oxygen starvation with clearly pronounced psychophysiological reactions against a background of cumulative fatigue. During this process, the cardiovascular and respiratory systems become conditioned, the interaction of all systems of the organism is coordinated more clearly, morale/willpower qualities are formed, as well as the capacity to overcome the feeling of fatigue. However, one should not fail to note that the effect is achieved

only with intensive and heavy loading. For increasing high altitude resistance, it is expedient to conduct exercises not less than 2 — 3 times per week, for a period of 2 — 2,5 months. Over this period of time, firm resistance for the ensuing 6 — 8 months is developed.

All these exercises for forming a high degree of resistance are conducted according to the rules on physical training.

Experience has shown that distances must be as follows: for swimming — 500 — 700 meters; for cross-country running — 3 km; for ski training — 10 km. In skiing, it is recommended that one vary methods of training — at first only uniform distances are covered, then varied ones, and, in accordance with this, the length of the training distance is changed.

During flight to intercept a target, the pilot experiences great emotional and physical stress: a whole complex of factors acts on him, and his resistance to these factors will determine, in the final analysis, the success of fulfilling the mission. Rapid takeoff, a large flow of information requiring rapid processing and response actions, maximum use of the tactical-technical data of the aircraft and a high degree of responsibility for fulfilling the mission — all these factors are to a known degree factors which cause significant psychophysiological reactions in the organism of the pilot. The primary means of [45] physical training for such flights are sports, relay races, personnel contests, as well as man-to-man combat and types of sports involving elements of risk.

As investigations have shown, cadets who have good physical data (motor coordination, muscular sense) developed in the process of training through sports were taught to intercept airborne targets two times more rapidly (than those who had not).

Low altitude flights also have their specific characteristics and are a cause of neuropsychological stress among flight personnel. The nearness of the ground, the complexity of visual orientation, the constant shifting of attention and the necessity for strict observance of the flight regime — all these factors complicate the activity of flight personnel. High speed flights increase even more the tempo of activity of flight crews: the search time is decreased, as are times for target acquisition and recognition, aiming, and bombing. One should also take the fact into account that low altitude flights are accompanied by high air turbulence near the ground, which causes variable g-forces and creates additional physical and psychological stresses.

Special physical training for such flights should be directed toward improving the adaptive mechanisms of the organism of the pilot, with respect to the unfavorable factors of low altitude flights.

A special place in the complex of facilities for special physical training is occupied by exercises for improving the emotional resistance, attention, and motor coordination, as well as resistance to g-forces. These include sports (basketball, handball, closed net volley ball, and table tennis), gymnastic exercises, exercises on special training apparatus (swing bar, swing board, gymnastic rings), acrobatic exercises, etc. When planning, one should provide for exercises to condition the cardiovascular system, the respiratory organs, and overall working capacity (cross-country runs, running different distances, ski training, swimming). Exercises conducted in combination are very important. In a single exercise session, one should employ specific means with constantly changing psychophysiological loads, as well as loads involving concentration and rapid shifting of attention. A mandatory condition is high tempo of the exercise session aimed at training for low altitude flights.

The aviation physician and the physical training supervisor must have a good knowledge of the individual characteristics of the pilots, and, together with the commander, determine the most efficient means and methods of physical training, taking into account the various stages of training and perfection of skills in low altitude piloting.

Unfortunately, norm estimates in different sections of physical training do not yet adequately reflect the preparedness of flight crews to fulfill any particular flying assignments. In most cases, these estimates are not linked with flight training either with respect to time or the stages of professional improvement.

In our view, planning physical training must answer a basic question: what is done at physical exercise sessions to increase the combat readiness of flight crews and flight safety? As both experience and special investigations have shown, for this purpose it is necessary at least once per quarter to conduct physical preparation of flight personnel, entering notes in flight and medical records. During this process, the pilots are obliged to accomplish special exercises (tests), whose quality of accomplishment reflects the psychophysiological resistance to flight factors. In case of inadequate preparation, the physician, together with the physical exercise supervisor, prescribes a combination of exercises for increasing the adaptational capacities of the organism to the unfavorable factors of flight. Naturally, during the estimate of physical training, both the specifics of flight duties and the specific conditions of professional activity, or the level of professional training of the pilot, must be used.

RECOMMENDED COMBINATIONS OF PHYSIOLOGICAL EXERCISES

(Approximations)

Psychophysiological qualities being developed	Exercises (tests)	Norms (minimum)
Resistance to roll and spatial orientation	From a sitting position, two somersaults forward, eyes closed, stand, one step to the left, right turn, stand, three seconds, open eyes.	Carry out clearly in ten seconds. Deviation or unstead posture are considered incompleted exercise.
Resistance to g-forces	Run 400 meters and do a turn on the horizontal bar.	Run 400 meters in 67 seconds with three lifts and turns in military uniform.
Resistance to hypoxia	Cross-country run 3 km, or ski 10 km, or breaststroke swimming, 200 m.	3 km — 13 min 0 sec 10 km — 60 min 200 m — 4 min 50 sec
Resistance to breathing under excess pressure	Swim using the "crawl" stroke — 100 m, or swim in combination No. 1 — 400 m.	100 m — 2 min 10 sec 400 m — 7 min 20 sec with submersion under water every 25 meters
Rapidity of actions and functions of attention	For flight personnel — exercises with a ball, (exercise) from military sports combination.	Minimum result for first age group.

The table shows approximate combinations of physical exercises (tests) whose accomplishment, to our view, can be viewed as the lower level, i.e., the minimum for the pilot. The suggested combination of exercises and the norms of their accomplishment correspond to the minimum requirements for estimating the physical and psychological preparedness for flight.

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15. Supplementary Notes

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16. Abstract

A description is given of exercises to be used for training pilots and cosmonauts. The types of exercises and the equipment to be used are itemized.

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